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THE TREATMENT OF PULMONARY TUBERCULOSIS.

BY
JOSEPH O. HIRSCHFELDER, M.D.,
OF SAN FRANCISCO, CAL.;
PROFESSOR OF CLINICAL MEDICINE IN THE COOPER MEDICAL COLLEGE.

FROM
THE MEDICAL NEWS,
July 3, 1897.

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THE TREATMENT OF PULMONARY TUBERCULOSIS.[1]

BY JOSEPH O. HIRSCHFELDER, M.D.,
OF SAN FRANCISCO, CAL.;
PROFESSOR OF CLINICAL MEDICINE IN THE COOPER MEDICAL COLLEGE.

IN the November number of the *Occidental Medical Times* of last year I described a method of treatment of pulmonary tuberculosis which was based upon some original conceptions of the mode of generation of antitoxins in the animal body. Further research and clinical experience has enabled me to confirm the statements made at that time, and also those contained in an additional note published one month later. My clinical observations, and those of my colleagues who have investigated the remedy, have established the efficacy of oxytuberculin beyond a doubt. Culture experiments, as will be seen, show how the agent acts and enables us to measure the potency of each preparation of the oxytuberculin in a manner that has not yet been possible with any of the antitoxic serums.

Before the year 1890 the attitude of the medical profession toward pulmonary tuberculosis was that of almost absolute helplessness. We had learned to diagnosticate the disease in its early stages by the microscopic examination of the sputum through the presence of the bacillus tuberculosis, but we felt that when we had established the presence of the dread

[1] Read before the California State Medical Society.

disease all that we could do was to send the hapless patient to a congenial climate in the hope that fresh air and exercise might prove of benefit. As far as active therapeutic intervention was concerned, however, we knew that we could do nothing. Then came the glad tidings that Koch had found the long-sought-for specific—that his tuberculin was the certain cure for tuberculosis wherever it might be found. We shall probably never again witness such enthusiasm in medical circles as that which was aroused by Koch's demonstration. We had learned to look upon his statements as demonstrated facts, for he had never until then enunciated a doctrine which had not been found to be correct. We even felt that the secrecy of the remedy was to be forgiven in him—although in another such a procedure would have been considered quackish. Truly it seemed marvelous that an infinitesimal quantity of an organic liquid injected under the skin of a tuberculous individual should cause a violent febrile reaction with congestion of the tuberculous mass, and no effect on other tissues. Everyone was eager to try the new remedy even if he did not know what it was, and happy was he if he were one of the favored few who could obtain it at any price. But the reaction came only too soon. Virchow showed at the *post-mortem* table what the influence of the tuberculin really was. In a large number of cases death was hastened by its use and dissemination of tubercle was induced by it to an extent that the great pathologist had not seen before. From that time on the credit of tuberculin began to wane, and soon it fell into disrepute as a remedy for tuberculosis with the vast majority of

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physicians. It still holds its place for diagnostic purposes, for the febrile reaction following its injection is a certain sign that tuberculosis is somewhere present in the body. We now know what tuberculin is and how it is prepared. Upon the surface of veal bouillon containing glycerin and peptone a pure culture of the bacillus tuberculosis is floated and cultivated at 38° Centigrade. After six to eight weeks a pellicle will have covered the surface and sunk to the bottom of the vessel. The fluid is then sterilized by heat, filtered through a Pasteur filter and evaporated to one-tenth its volume. This is the crude tuberculin such as was formerly used. Now this crude liquid is precipitated with alcohol, washed, and dissolved in water.

Feeling that there was an element of truth in the statements of Koch that tuberculin cures consumption, and that the ill effects resulting from its use must be due to some extraneous foreign elements, several investigators have attempted to purify it and have used what they supposed to be a purified tuberculin under various names. The most prominent of these preparations is that of Klebs, which he terms "antiphthisin." Unfortunately the claims made by Klebs have not been confirmed by experience. Trudeau has clearly proved that antiphthisin is merely a very dilute tuberculin. We will see during the course of these remarks that Trudeau was quite correct when he stated that Klebs erred in affirming that tuberculin inhibited the growth of the tuberculosis bacillus, for he showed that it is the acid that develops in the culture-fluid which acts as a preventive of further growth. I can confirm Trudeau's state-

ments, for in equal parts of tuberculin and veal bouillon which has been made alkalin, the tubercle bacillus grows as freely as in the plain veal bouillon. Clinical observations have been as adverse to the claims of Klebs as have been laboratory experiments.

In 1890 Behring enunciated the doctrine of the antitoxic substances which develop in the animal organism from the bacterial toxins, and this led to the introduction of the antitoxin of diphtheria into general medical practice. In spite of occasional adverse criticism and an occasional death due directly to the remedy, it has proved its value in the treatment of diphtheria beyond a doubt, and thousands of lives are yearly saved that would otherwise undoubtedly have been lost.

Stimulated by these excellent results, numerous investigators have attacked tuberculosis in a similar manner and have probably met with some success. This is true of Paquin in our country and Maragliano in Italy. Their method of procedure is to inject gradually increasing quantities of tuberculin hypodermically into a horse until the animal becomes immune to such large injections. The blood is then drawn from the jugular vein into a sterile flask, allowed to coagulate in a cool place, and the sterile serum is drawn off for use as the antitoxin. It will require a long observation of results by many clinicians before we will be able to arrive at a knowledge of just how much may be accomplished by this serum. But even if it should be finally proved that an antituberculin develops in animals so treated, its use as a curative agent in man is attended by several obstacles and dangers. In the first place, the quantity of tuber-

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culin used, and hence the quantity of antituberculin developed, is so infinitesimal that when dissolved in the blood and plasma of the animal it is present in such minute proportions that the numeral would be far removed from the decimal point in its representation in figures. In the second place, the antituberculin elaborated in the blood must be administered dissolved in the serum of the animal. We know from several deaths which have immediately followed the administration of the diphtheria antitoxin that this is by no means an indifferent substance which may be administered in unlimited quantities. We know that in the animal body the antitoxin develops in some manner from the toxin; if we were able to discover the process it is clear that we might be able in our laboratories to imitate the method and so produce the sought-for remedy in unlimited quantities and free from deleterious admixture. Until now no satisfactory theory has been established, and no indication has been given of the lines upon which to proceed.

With regard to tuberculosis, however, it seems to me that the course to pursue has long been before the medical profession even though we have been unable to read what Nature has written for us in her hieroglyphics. The theory which lies at the foundation of the therapeutic measures about to be described is even more important than the results themselves, for if it should be found to be correct, it will be an addition to our biologic knowledge of the greatest scientific importance. This theory was thought out early in October, 1895, and the various modes by which it might practically be applied were clear before a

single step was taken. In other words, the theory was not evolved from the therapeutic results, but the method of treatment was a consequence of the biologic proposition. The therapeutic success may therefore be looked upon as a verified prediction, and hence has far greater evidential value than it otherwise could have. The treatment of patients by the new method was very cautiously begun on October 22, 1895, and as the results warranted, the doses were gradually increased until after a few months efficient quantities were administered. I am pleased to be able to say that to my knowledge no patient has been injured by the use of the remedy.

In 1864 Spencer Wells performed laparotomy, in consequence of an erroneous diagnosis, upon a patient suffering from tuberculous peritonitis. Contrary to all expectations, the patient recovered. Numerous cases have since been reported in which the same favorable results occurred; indeed, the peritoneum which was observed at the operation to be studded with tubercles has been found years after, at a second operation, to be smooth and free from all tuberculous deposits. Distant tuberculosis has also been observed to disappear after laparotomy upon a tuberculous peritoneum. It appears most probable that in these cases the entrance of air into the peritoneal cavity must have been the important factor; that an oxidation of the tuberculin present in the effusion was thus brought about and that it was this oxytuberculin which effected the cure both of the local and of the general tuberculosis. It certainly seems a very probable hypothesis that it is by oxidation that the toxin is changed into antitoxin in the animal body, for

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there is no process of the economy so universal as oxidation. The first and most evident result of the introduction of a toxin is fever, with increased oxidation as if Nature was striving with all her power to change by this process the poisonous substance into its antidote.

Acting upon this hypothesis the problem of finding a method of oxidizing the toxin without completely destroying it presented itself, and various methods of accomplishing this result were investigated. I will not weary you with a description of the different forms of experiment which were attempted, nor of the steps which were taken until the method was finally perfected, but shall describe in as detailed a manner as I can the mode in which oxytuberculin in now manufactured. I found very soon in the course of my experiments that the peroxid of hydrogen was the substance for which I was seeking, and that it is a powerful oxidizer but not so destructive as is generally supposed. When I added it to tuberculin at a low temperature and injected the latter into a tuberculous patient or animal even after the mixture had stood for some time it produced the same reaction as if pure tuberculin had been used. I found that in order to avoid such reaction it was necessary to heat the mixture for at least ninety-six hours. I have lately found it wise to lengthen the period of heating even more, and now I sterilize it for 120 hours, obtaining better results than formerly. I formerly used the tuberculin prepared by Koch in Berlin, but have been able to obtain still better results with one of my own growth, made by the development of a highly virulent bacillus of tuberculosis upon veal bouillon con-

taining four per cent. of glycerin, one per cent. of peptone, and one-half per cent. of chlorid of sodium, to every liter of which, when neutralized, 3 c.c. of a normal solution of carbonate of sodium is added. In this culture-fluid the germ has developed with gradually increasing rapidity so that whereas ordinarilly it takes six weeks for the culture-fluid to be completely covered by the growth, this now occurs in my laboratory in less than three weeks. Injected into guinea-pigs it kills many of them in less than three weeks, the organs being overwhelmed with tuberculous nodules.

After the germ has fully grown so that the tuberculous scum which floats on the surface begins to sink, the flask is sterilized by heat for two hours, and the contents are filtered. This is the tuberculin I use. A measured quantity is put into a stone jug and one-tenth the quantity of a ten-volume solution of peroxid of hydrogen is added, and the jug is stoppered with cotton and put into a sterilizer at 100° C. Every twelve hours the same quantity of peroxid of hydrogen is added until the process has been repeated the tenth time, so that, in all, the quantity of solution of peroxid of hydrogen added shall equal the quantity of tuberculin used. This is then heated to 100° C. for twelve hours longer, and at the end of that time (120 hours in all) it is found still to contain free peroxid of hydrogen, is highly acid, and is decidedly darker than was the original tuberculin. It is made alkalin with caustic soda and reheated to drive off the excess of peroxid of hydrogen. Five per cent. of boric acid is added to keep it from decomposing. It is filtered into sterile vessels and is ready for use.

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It now does not contain a trace of the peroxid of hydrogen, which has all been changed to water.

Theoretical objections have been made to the process by some who claim that the peroxid of hydrogen must rapidly be destroyed by the organic substances present in the liquid. It is very easy to prove that this supposition is incorrect, for at any stage of the process up to the final addition of the alkali free peroxid of hydrogen may be found by the usual chemic tests, such as the blue color which develops with the iodid of starch, and the pretty reaction with a mixture of bichromate of potash and sulphuric acid, in which the free peroxid of hydrogen causes a beautiful blue color to develop.

The greatest possible care is necessary in the preparation of this oxytuberculin, for if any appreciable quantity should escape oxidation fatal tuberculin poisoning might result from the large quantities which must be administered. It should be carefully tested, first on animals and then on patients. This oxytuberculin, after it has been thus carefully prepared and tested, is injected hypodermically into any part of the body. I prefer the back and inject the remedy well under the skin. The most scrupulous care must be taken. If the lymph should be in the least clouded, or any other condition be present that would suggest infection, it should be sterilized by heat for at least fifteen minutes. Ordinary syringes should not be used, but such as are employed with antitoxin. I have made many thousand such injections without causing the formation of a single abscess or even an induration of the skin. The liquid causes no greater local disturbance than any indifferent fluid would

produce. There is no reddening of the skin or other sign of localized inflammation. In a few minutes the fluid injected is absorbed and the patient suffers no further inconvenience except sometimes a little smarting at the site of injection. There is no rise of temperature, or any other unpleasant constitutional effect. Within a few days the cough and expectoration diminish, and the most striking effect is the rapid improvement in the appearance of the patient. His eyes become bright and his color changes from the gray hue of tuberculosis to one more nearly resembling that of health. The appetite rapidly returns, and with it a feeling of vigor which is most pleasing to the patient and to the physician. This is especially evident in the very early cases in which there is little or no fever. In cases in which only slight fever is present the higher temperature soon diminishes and in many instances becomes entirely normal. At the same time the infiltration of the lung gradually disappears, so that a most careful examination fails to reveal any deviation whatsoever from the normal after the treatment is completed. The tubercle bacilli in the sputum may rapidly diminish in number and finally disappear altogether, as I have found in a number of cases.

Every physician has seen patients with tuberculosis recover, but it has never before been my good fortune to witness such rapid changes as have taken place in several that had been examined by other physicians both before and during the treatment. The patients that have recovered have thus far remained well. If any test of the method should be made by other members of the profession I would

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earnestly request that provisionally only early cases of the disease be treated, in which there is no development of cavities in the lung, in which fever is slight, and in patients in whom the constitutional condition is such that a return to health may reasonably be expected.

One of the most striking demonstrations of the value of the remedy occurred in a case of tuberculosis of the hand. A physician infected the dorsum of his right hand, and an ulceration developed which microscopic examination showed to be tuberculous. It was treated in the usual manner, and without beneficial result, so that the surgeon was about to make an extensive excision which was to be followed by skin grafting. Instead, local applications of the oxytuberculin were made and very rapid healing took place, leaving behind the same kind of scar as would have resulted from a non-infected ulcer. As a confirmation of this observation I show you here a dog that was vaccinated upon the back in a large number of places with a virulent pure culture of tubercle bacilli. After a short time, numerous tuberculous ulcers developed, in the pus of which the bacilli of tuberculosis were demonstrated. A section made by Dr. Rixford showed bacilli in the tissues. The dog was then chloroformed and a piece of the skin with the tuberculous ulcers was removed. The dog was then treated daily with hypodermic injections of oxytuberculin. The ulcers rapidly healed, and you now see the animal with the scar resulting from the removal of part of the tuberculous skin but with no sign of the disease with which he was inoculated. I will say that since the injections of oxytuberculin

the dog that was ailing, feeble, and without desire for food, has become bright, strong, and vigorous, and has developed a voracious appetite.

The patients that have been treated by me with the oxytuberculin, those who came in the very early stage of the disease, before cavities were present, have been rapidly cured. By cure I mean a complete cessation of cough and disappearance of all symptoms of disease on the part of the patient, together with the return of a normal condition of the lung, as shown by physical examination. Above all, do I demand in these cases that the tubercle bacilli shall no longer be found in the sputum. Patients in whom the disease was moderately advanced have likewise rapidly improved, and some have entirely recovered. Of the very advanced cases, many have shown marked improvement, and many patients that I have declined to treat as being too far advanced but who pleaded so hard for the treatment that I could not refuse, have surprised me by the wonderful improvement they have shown. Some in the last stages of the disease who presented themselves with high fever, and who were cyanotic and gasping, have died. No treatment could be expected to benefit such patients. Of course they throw a cloud upon the statistics for they must honestly be reported with the more favorable ones. I shall therefore present to you all of the cases I have treated with oxytuberculin, but request you not to judge of the treatment by the advanced cases, for which I make no claim, whatsoever.

In order to systematize our observations I will divide the cases into four sets depending upon the

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stage of the disease. In the first stage we find infiltration of the lungs, with more or less pallor, loss of weight, and cough, and with sputum containing tubercle bacilli. The bacilli may be absent at repeated examinations and yet finally be found. In the second stage there is extensive infiltration of the lungs, with hectic fever, emaciation, and a large quantity of sputum containing the bacilli, but no cavities. In the third stage there are cavities, but still a fair degree of vigor. There is no dyspnea when the patient is quiet, but marked shortness of breath on exertion. In the fourth stage there are large cavities, with the usual signs of advanced consumption, and the dyspnea is very decided even when the patient is sitting or lying down.

Many of the patients here presented in person and represented in the accompanying table have been seen by other physicians before and during the treatment. My colleagues have confirmed my observations, and I am certain that they will agree that I have not erred in making my reports too favorable. It has been my purpose to be as skeptical as possible and I have striven to make the showing rather less favorable than too much so. I find that the patients that had been treated with oxytuberculin insufficiently oxidized did not give the same results as those treated with the newer preparation, and therefore have tabulated the cases separately.

Clinical observation having thus shown the very marked effect of oxytuberculin, it remains for us to establish in what manner this cure is effected. There are two methods by which the body may rid itself of an invading micro-organism; the one is by the en-

feeblement of the germ, and the other is by the invigoration of the body so that it becomes sufficiently potent to expel the invader. We know that we are all constantly taking the bacillus of tuberculosis into our bodies. It has been shown by Loomis at *post-mortem* examinations of healthy individuals who have died from accident that many have tubercle bacilli stored up in the bronchial glands, out of harm's way but alive and able to infect guinea-pigs when injected into them. Again, we constantly observe that tuberculosis develops when the patient becomes physically depressed, when the vital forces are at low ebb. On the other hand, innumerable patients with consumption recover under the influence of favorable hygienic conditions. The antitoxins of the infectious diseases probably act in a somewhat similar manner, for experiment has proved that they neutralize the pernicious toxins which are formed by the germs and which enfeeble the body by their poisonous influence. Upon the germs themselves they have little influence, for we know that pathogenic organisms flourish in the very serum which is used to antagonize their effect upon the body. How is it with oxytuberculin? It will be my privilege to prove to you that oxytuberculin directly prevents the growth of the bacillus of tuberculosis; that its action is specific upon that germ and that it is not due to a general antiseptic effect. If we take veal bouillon containing 4 per cent. of glycerin, 1 per cent. of peptone, and 1½ per cent. of salt, and add to every 1000 c.c. thereof, when neutralized to litmus, 3 c.c. of a normal solution of carbonate of soda, we will find that the bacillus tuberculosis will grow vigorously upon it. If

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we mix this veal bouillon with equal parts of tuberculin, made similarly alkalin, the germ will flourish just the same, but if we use oxytuberculin made from the same tuberculin rendered alkalin to the same degree, the bacillus of tuberculosis will not grow. In other words, the oxytuberculin inhibits in the culture-tube the growth of the germ of tuberculosis just as it cures the consumption in the patient. Not only can this be proved by the simple culture experiment, but the strength of the oxytuberculin can most accurately be gauged by the same process. If to our standard alkalin-glycerin-veal-bouillon we add oxytuberculin in varying proportions, it will be a simple matter to find the weakest dilution of the oxytuberculin in which the growth of the bacillus will be inhibited, and thus it may be standardized. In a similar manner any oxytuberculin may be standardized, so that when we use it we may know accurately how potent the remedy is which we are employing. Such a method of estimating the strength of a preparation is infinitely superior to that of judging it from its effect upon more or less resistant animals.

From the very beginning of the experiments it was my purpose to discover some means of knowing how long I should continue the oxidation in order that all of the tuberculin should be changed to oxytuberculin, and none of the latter be destroyed. There was no chemical test known, and all of my efforts to find one were in vain. I was therefore compelled to make use of the reaction of tuberculous guinea-pigs to find the point when no effective tuberculin could be found. It is clear that a certain amount of the tuberculin might be present but

neutralized in its effects by the oxytuberculin. Under such circumstances we would get no deleterious tuberculin influence, but still not the best possible oxytuberculin action. In the manufacture of the oxytuberculin I had gradually begun to lengthen the time during which I heated the tuberculin with the peroxid of hydrogen, and finally decided upon the method of sterilizing for four days. Oxytuberculin so prepared gave excellent results and no reactions until I happened to use large doses (40 c.c.) in the case of a highly sensitive hospital patient. A slight rise of temperature occurred that made me feel that all of the tuberculin had not been converted. About this time I had discovered the inhibitory influence of the oxytuberculin, and I immediately concluded that this influence would teach me what was the best length of time to continue the oxidation. I reasoned that if my theory was a correct one, as I continued the oxidation, this inhibitory power must gradually increase until the maximum is reached, and as the oxytuberculin produced is gradually destroyed by further oxidation, from this point on there must be a gradual decline of this inhibitory power. Such, indeed, was the result obtained. I sterilized tuberculin with peroxid of hydrogen for 176 hours, adding the peroxid every twelve hours and removing portions of the lymph for comparison at 96, 120, 144, and 156 hours. The final oxytuberculin which had been sterilized 176 hours contained but fifty-three per cent. of the quantity that was present in that sterilized only ninety-six hours, and in order to make a fair comparison, after free peroxid in all the preparations was removed by rendering them alkalin and

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heating, all were diluted to the same proportion with distilled water, the quantity added depending upon the degree to which it had been diluted in the process of preparation by addition of peroxid of hydrogen, which, of course, had become changed to water. All of the preparations were then neutralized and three-tenths of one per cent. of normal carbonate of soda added. Each of the oxytuberculins was mixed with an equal quantity of standard veal bouillon and inoculated with a pure culture of the bacillus tuberculosis. As a control, standard veal bouillon was mixed with an equal quantity of water to which three-tenths of one per cent. of normal carbonate of soda was added and was likewise inoculated with the same germ. There was rapid growth in the veal bouillon, less in the 96-hour oxytuberculin, and hardly any in the 120-hour oxytuberculin, which, you will remember, had been diluted with water and veal bouillon to only 26½ per cent. In the 144-hour oxytuberculin growth increased, was greater in the 156-hour preparation, and in that sterilized 176 hours was almost as great as in the veal bouillon. This simple experiment not only confirmed our previous culture-tests, but likewise taught that at least 120 hours and less than 144 hours are necessary to obtain the best results. In point of fact, as soon as I began to use oxytuberculin so prepared upon my patients immediate and striking results occurred such as I had not witnessed before. I shall now narrow the range still more by tests of oxytuberculins heated for different periods between 120 and 144 hours. I have done this in part with another sample of oxytuberculin which was

sterilized 144 hours and a portion removed after 134-hours' sterilization. These were made 0.3 per cent. normal alkalin, and each was mixed with equal quantities of standard veal bouillon. They were inoculated with tuberculosis at the same time as was veal bouillon. Three cultures of veal bouillon and four each of 134- and 144-hours' oxytuberculin were made. All of the veal bouillon and all of the 144-hour oxytuberculin flasks showed vigorous growth and none of the 134-hour oxytuberculin flasks.

Provisional experiments made with cultures of staphylococcus, micrococcus ureæ, bacillus typhosus, and bacillus diphtheriæ have given results analogous to those obtained with the bacillus tuberculosis. Cultures of these germs were sterilized and filtered in the same manner and were oxidized similarly with the peroxid of hydrogen for various periods and then treated in the same manner. They were likewise mixed with veal bouillon and inoculated with the respective germs, as was a control with veal bouillon. In all of them a complete suppression of the growth of the micro-organism occurred, but the length of time that oxidation was necessary to produce this result differed with different germs. The presence of the inhibitory action of the oxytoxin upon growth of the germ in four cases, in addition to that observed, proves the universality of the law and permits us to reason from analogy that not only will all of these diseases yield to oxytoxic treatment, but that this must be true of every disease the germ of which we can cultivate.

I will now call your attention to the tables which show the effect of the oxytoxins of the various germs.

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As my attention had been directed to the faint possibility that the inhibitory influence might be due to the reaction of peroxid of hydrogen on veal bouillon, I treated that liquid with the oxidizer in the same manner as the cultures, sterilizing for 130 hours, and found that it had no effect whatsoever in any case.

MICROCOCCUS UREÆ.

Hours of oxidation.	Hours of growth.			
	24	30	43	70
43	?	Growth.	Growth.	Growth.
65	No growth.	No growth.	No growth.	No growth.
90	No growth.	No growth.	No growth.	No growth.
125	No growth.	No growth.	No growth.	No growth.
130	No growth.	No growth.	No growth.	No growth.
Veal bouillon	Growth.	Growth.	Growth.	Growth.

TYPHOID.

Hours of oxidation.	Hours of growth.			
	24	30	43	70
43	Growth.	Growth.	Growth.	Growth.
65	Growth.	Growth.	Growth.	Growth.
90	Growth.	Growth.	Growth.	Growth.
125	Growth.	Growth.	Growth.	Growth.
130	No growth.	No growth.	No growth.	No growth.
Veal bouillon	Growth.	Growth.	Growth.	Growth.

DIPHTHERIA.

Hours of oxidation.	Hours of growth.			
	24.....	30.....	43.....	70.....
43	Growth.	Growth.	Growth.	Growth.
65	No growth.	No growth.	No growth	No growth.
90	No growth.	No growth.	No growth.	No growth.
125	No growth.	No growth.	No growth.	Slight.
130	Growth.	Growth.	Growth.	Growth.
Veal bouillon....	Growth.	Growth.	Growth.	Growth.

STAPHYLOCOCCUS.

Hours of oxidation.	Hours of growth.			
	24.....	30.....	43.....	70.....
43	Growth.	Growth.	Growth.	Growth.
65	Growth.	Growth.	Growth.	Growth.
90	Growth.	Growth.	Growth.	Growth.
125	Growth.	Growth.	Growth.	Growth.
130	No growth.	No growth.	No growth.	No growth.
Veal bouillon....	Growth.	Growth.	Growth.	Growth.

All of these tests show conclusively that the oxy-tuberculin inhibits the growth of the bacillus of tuberculosis. That this is a specific effect and not due to a general antiseptic action is proved by the facility with which other germs develop in the fluid. From all of the statements made, I believe that I have proved beyond reasonable doubt that consumption

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may be cured by the use of oxytuberculin if the remedy is administered during the early stages of the disease, and that the cure is effected by a direct action upon the causative germ.

GENERAL SUMMARY.

Stage.	Total number treated.	Cured.	Much improved.	Slightly improved.	Unimproved.	Worse.	Dead.
4th, old method	16	0	1	2	3	6	4
4th, new method	11	1	1	1	2	1	1
3d	25	2	8	2	3	0	0
2d	9	4	5	0	0	0	0
1st	4	4	0	0	0	0	0
Total	65	11	29	5	8	7	5

FIRST STAGE.

No.	Name.	Number days treated.	Bacilli.		Cured.	Much improved.	Slightly improved.	Unimproved.	Worse.	Dead.
			Before.	After.						
1.	F. A. A.	134	Moderate.	None.	1	0	0	0	0	0
2.	M. L.	16	None.	None.	1	0	0	0	0	0
3.	M. Q.	305	None.	None.	1	0	0	0	0	0
4.	R. W. R.	106	None.	None.	1	0	0	0	0	0

SECOND STAGE.

No.	Name.	Number days teeated.	Bacilli.		Cured.	Much improved.	Slightly improved.	Unimproved.	Worse.	Dead.
			Before.	After.						
1.	E. G.	258	Large.	None.	1	0	0	0	0	0
2.	W. M.	75	Mod-erate.	Not ex.	0	1	0	0	0	0
3.	N. R.	83	Large.	Hardly any.	0	1	0	0	0	0
4.	E. S.	91	Large.	Mod. large.	0	1	0	0	0	0
5.	Father S.	99	Mod-erate.	None.	1	0	0	0	0	0
6.	V. C.[1]	100	None found.	None.	1	0	0	0	0	0
7.	C. V.	90	Mod-erate.	None.	1	0	0	0	0	0
8.	T. L.	180	Large.	None.	0	1	0	0	0	0
9.	R. W. R.[2]	36	None.	None.	0	1	0	0	0	0

[1] Sputum not examined until (through oversight) the patient had been treated one month.

[2] Bacilli found by former physician who sent the patient to me.

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THIRD STAGE.

No.	Name.	Number days treated.	Bacilli.		Cured.	Much improved.	Slightly improved.	Unimproved.	Worse.	Dead.
			Before.	After.						
1.	D. B.	26	Moderate.	Not ex.	0	0	0	1	0	0
2.	S. D.	254	Large.	None.	1	0	0	0	0	0
3.	E. E.	37	Large.	Not ex.	0	1	0	0	0	0
4.	A. G.	126	Moderate.	Large.	0	1	0	0	0	0
5.	F. J.	162	Large.	None.	0	1	0	0	0	0
6.	M. L.	31	Large.	Large.	0	0	1	0	0	0
7.	J. M.	141	Large.	Hardly any.	0	1	0	0	0	0
8.	S. M.	365	Large.	Moderate.	0	1	0	0	0	0
9.	A. M.	30	Large.	Not ex.	0	1	0	0	0	0
10.	C. M.	22	Moderate.	Not ex.	0	0	1	0	0	0
11.	R. N.	237	Large.	Moderate.	0	1	0	0	0	0
12.	H. P.	285	Large.	None.	0	1	0	0	0	0
13.	T. P.	33	Large.	Not ex.	0	0	0	1	0	0
14.	L. T.	40	Moderate.	Not ex.	0	0	0	1	0	0
15.	F. A. S.	198	Moderate.	Moderate.	0	1	0	0	0	0
16.	C. H. W.	42	Large.	Large.	0	1	0	0	0	0
17.	M. W.	146	Moderate.	Few.	0	1	0	0	0	0
18.	J. W.	254	Large.	None.	1	0	0	0	0	0
19.	T. M.	250	Large.	Moderate.	0	1	0	0	0	0
20.	F. D. R.	300	Large.	None.	0	1	0	0	0	0
21.	W. H.	280	Large.	Moderate.	0	1	0	0	0	0
22.	M. W.	120	Small.	Small.	0	1	0	0	0	0
23.	P. S.	40	Moderate.	Moderate.	0	1	0	0	0	0
24.	J. D.	30	Large.	Large.	0	1	0	0	0	0
25.	T. T.	80	Large.	Moderate.	0	1	0	0	0	0

FOURTH STAGE, OLD METHOD.

No.	Name.	Number days treated.	Bacilli.		Cured.	Much improved.	Slightly improved.	Unimproved.	Worse.	Dead.
			Before.	After.						
1.	M. A.	123	Large.	Large.	0	0	1	0	0	0
2.	E. B.	48	Large.	Not ex.	0	0	0	0	0	1
3.	F. B.	77	Large.	Not ex.	0	0	0	0	0	1
4.	H. C.	72	Large.	Not ex.	0	0	0	0	1	0
5.	M. G.	106	Large.	Not ex.	0	0	0	0	1	0
6.	G. A. H.	132	Large.	Not ex.	0	0	0	0	0	1
7.	A. H.	48	Large.	Not ex.	0	0	1	0	0	0
8.	G. H.	54	Large.	Not ex.	0	0	0	1	0	0
9.	T. H.	30	Large.	Not ex.	0	0	0	0	1	0
10.	J. McM.	100	Large.	Not ex.	0	0	0	0	0	1
11.	J. R.	102	Large.	Not ex.	0	0	0	0	1	0
12.	G. St. D.	77	Large.	Not ex.	0	0	0	0	1	0
13.	O. R.	120	.....	Not ex.	0	0	0	1	0	0
14.	J. H.	39	Moderate.	Not ex.	0	0	0	1	0	0
15.	A. V.	135	Large.	Few.	0	0	0	0	1	0
16.	H. F.	90	.....	Not ex.	0	1	0	0	0	0

FOURTH STAGE, NEW METHOD.

No.	Name.	Number days treated.	Bacilli.		Cured.	Much improved.	Slightly improved.	Unimproved.	Worse.	Dead.
			Before.	After.						
1.	D. A. C.	172	Large.	Moderate.	0	0	0	1	0	0
2.	C. F.	165	Large.	Moderate.	0	0	1	0	0	0
3.	T. J.	164	Large.	Not ex.	0	0	0	0	1	0
4.	G. A. K.	57	Large.	Not ex.	0	0	0	0	0	1
5.	J. M.	481	Large.	None.	1	0	0	0	0	0
6.	J. M.	365	Large.	Hardly any.	0	1	0	0	0	0
7.	B. M.	363	Large.	Very few.	0	1	0	0	0	0
8.	W. R. P.	54	Large.	Large.	0	0	0	1	0	0
9.	P. P.	235	Large.	Moderate.	0	1	0	0	0	0
10.	G. Ph.	199	Large.	Moderate.	0	1	0	0	0	0
11.	D. H.	130	Large.	Moderate.	0	1	0	0	0	0

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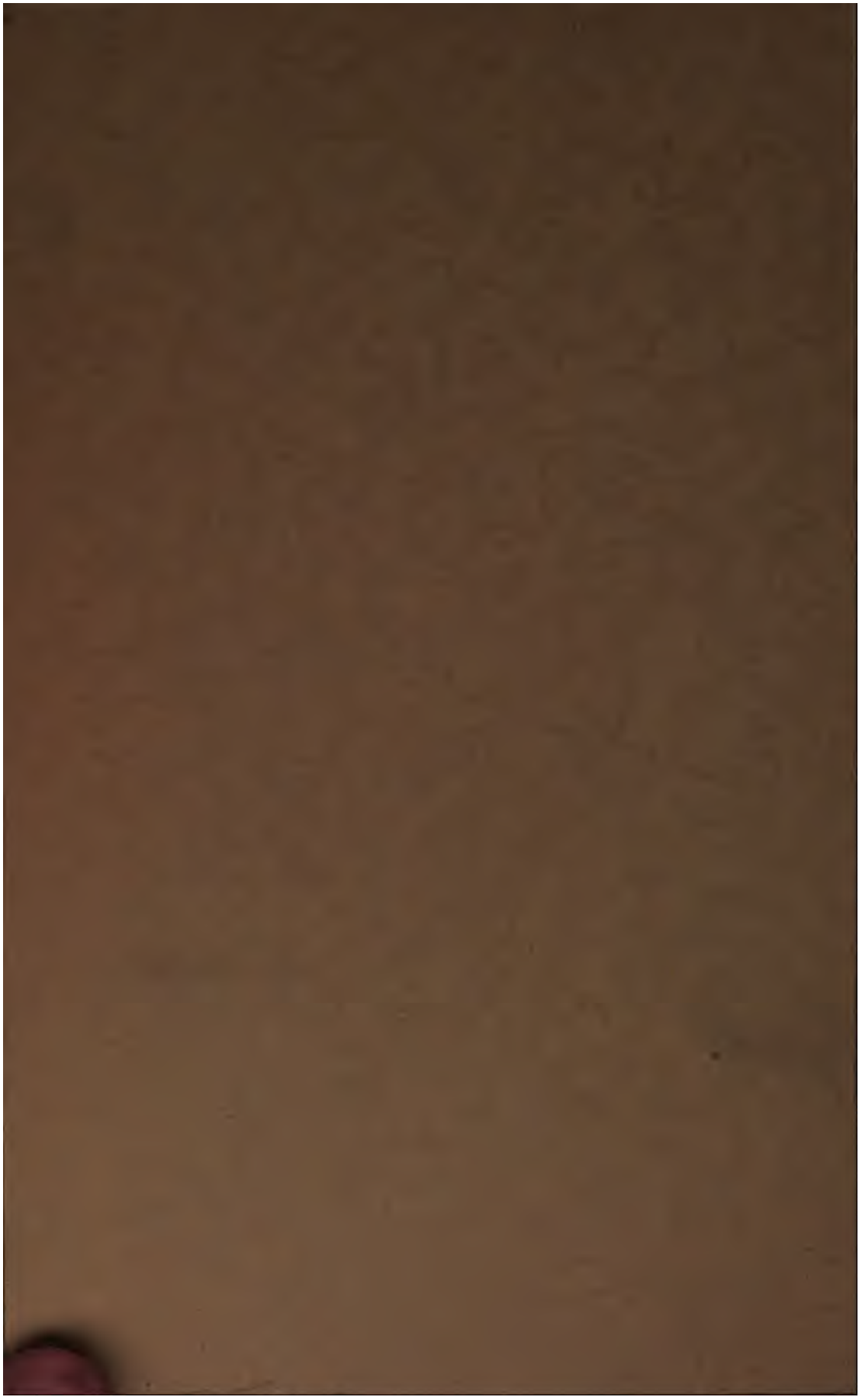
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